REMARKS

1. Status of the Claims

Claims 1-18 are pending in this Application. No claims have been canceled. By this Response, Applicant amended Claims 1 and 7-13. Applicant respectfully submits no new matter was added and that the amendments are fully supported by the application as originally filed. Accordingly, Claims 1-18 are at issue.

2. Objection to the Claims

The Examiner has objected to claims 1, 7, and 13 due to certain informalities and has requested Applicant to amend these claims to recite "minimized" instead of "minimised". Applicant has amended the claims as suggested by the Examiner and therefore requests the Examiner to withdraw the objection.

3. Claim Rejections – 35 U.S.C. § 101

The Examiner has rejected claims 1-6, 7-12, and 13-18 under 35 U.S.C. § 101 contending that the claimed invention is directed to non-statutory subject matter, and in particular, to a mathematical abstraction and/or algorithm. Applicant respectfully traverses the rejection.

In *AT&T Corp. v. Excel Comm., Inc.*, the Federal Circuit stated that "even though a mathematical algorithm is not patentable in isolation, a process that applies an equation to a new and useful end is at the very least not barred at the threshold by § 101." 172 F.3d 1352, 1357 (Fed. Cir. 1999) *Id.* at 1357. The Federal Circuit also noted that in *Diamond v. Diehr*, 450 U.S. 175 (1981), the Supreme Court had specifically rejected the argument that computer-based programs are not patentable. *Id.* Indeed, more than an abstract idea is claimed when the claimed invention as a whole is directed toward forming a specific machine that produces a useful,

concrete, and tangible result. *Id.* As a result, a computer that applies a mathematical algorithm is patentable subject matter under 35 U.S.C. § 101.

Similarly, in *In re Warmerdam* the Federal Circuit stated that while a purely mathematical algorithm may not be patented, a claim for a machine is clearly patentable subject matter. 33 F.3d 1354, 1360 (Fed. Cir. 1994). Accordingly, the Federal Circuit held that a claim which covered a machine that performed a method was patentable subject matter. *Id.*

Claim 1, as amended herein, is directed to "a ***computer implemented*** method for operating a computational device as a support vector machine in order to define a decision surface separating two opposing classes of a training set of vectors." Claim 1 requires a number of processes to be performed on a computational device. As disclosed in ¶0002 of the specification, and as an example, a Support Vector Machine (SVM) is a universal learning machine, that during a training phase, determines a decision surface or "hyperplane". Further, as explained in ¶0057, given that it is desirable to find the maximum margin, and that we can calculate the distance between any two points in the test set, the optimal vectors to preselect as potential support vectors are those closest to the decision plane. The vectors closest will be the ones with the minimum distance to the opposing class. The method of claim 1 is directed to defining the decision surface separating two opposing classes of a training set of vectors, and therefore produces a useful, concrete, and tangible result.

Claim 7, as amended herein, is directed to a computer readable carrier medium having instructions for execution by one or more processors of a computer system. Claim 1 requires a number of instructions, which when executed by one or more processors of a computer system, perform certain functions and provide an output. For example, claim 7 requires an instruction, when executed, that determines a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, under 35 U.S.C. § 101, and the prevailing case law cited above, claim 1

includes a specific "machine" (*i.e.*, one or more processors of a computer system) that executes instructions.

Similarly, claim 13 is directed to a computational device configured to define a decision surface separating two opposing classes of a training set of vectors. The computational device includes one or more processors arranged perform certain functions. For example, claim 13 requires a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, under 35 U.S.C. § 101, and the prevailing case law cited above, claim 1 includes a specific "machine" (*i.e.*, a computational device including one or more processors) that executes instructions.

Therefore, Applicant submits that claims 1, 7, and 13 are directed to subject matter patentable under 35 U.S.C. § 101. In addition, claims 2-6, 8-12, and 14-18 depend on claims 1, 7, and 13, respectively and include the limitations of their respective claim. Therefore, Applicants submit that claims 2-6, 8-12, and 14-18 are also directed to subject matter patentable under 35 U.S.C. § 101.

4. **Rejection of Claims under 35 U.S.C. 103(a)**

Claims 1, 7 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over an article by Fung et al., "Minimal Kernel Classifiers," 2002 (Fung) in view of an article titled "Cluster Analysis," 2001 (CA). Applicant respectfully submits that combination of the cited references is improper, but even if proper, Applicant's invention is patentable over the combination of references.

Applicant respectfully submits that claim 1 is patentable over Fung in view of CA. Claim 1, as amended herein, is directed to "a computer implemented method for operating a computational device as a support vector machine in order to define a decision surface separating two opposing classes of a training set of vectors" The method of claim 1 includes the steps of "associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class" and "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized."

Fung is directed to finite concave minimization algorithm for constructing kernel classifiers that use a minimal number of data points for generating and characterizing a classifier. As a preliminary matter, Applicant agrees with Examiner's contention that Fung fails to disclose "associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class. CA is directed to a classification method used to arrange a set of cases into clusters such that the cases within a cluster are more similar to each other than they are to cases in other clusters. Both Fung and CA, alone or in combination, fail to teach, disclose, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized", as required by claim 1.

Fung requires that the complete training set is used as an initial set selection. In particular, Fung describes that an *m x n* matrix A is subjected to certain calculations. The entire dataset is reduced to a ***post-analysis*** of the selected vectors and subsequent removal of vectors that have a minimal effect on the error when the set is used for classification/regression (*See* p. 305, ¶2). Conversely, claim 1 requires that the complete training set is considered ***before*** any support vector calculations are performed (*i.e.*, determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized). This linearly independent set of vectors is selected such that the sum of the

distance to the vectors in the opposite class is minimized. Neither Fung nor CA teach, disclose, or suggest this initial reduction of the training set and the subsequent improvements achieved by this approach.

Further, Fung fails to teach, disclose, or suggest minimizing the sum of the distances between opposite class support vectors. Instead, Fung teaches maximizing the margin between two bounding planes. Figure 1 of Fung discloses that data points A+ and A- are separated by a separating surface along with a margin indicated by opposing arrows. Fung teaches that that classification is performed by ***maximizing*** the margin $2/\|\omega\|_2$ as shown in Figure 1 (*See* Fung, p. 305). As such, Fung fails to teach, disclose, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is ***minimized***."

In addition, CA also fails to disclose, teach, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized." As a result, Applicant respectfully submits that claim 1 is patentable over Fung in view of CA. Additionally, claims 2-6 are dependent on claim 1 and include all of its limitations. Therefore, Applicant respectfully submits that claims 2-6 are also patentable over Fung in view of CA.

Similarly, Applicant submits that Claim 7 is patentable over Fung in view of CA. Claim 7 is directed to a computer readable carrier medium for execution by one or more processors of a computer system. Among other limitations, claim 7 requires instructions to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. For the reasons stated with respect to claim 1, Applicant respectfully submit that Fung and CA, alone or in combination, fail to disclose, teach, or suggest instructions to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the

linearly independent support vectors is minimized. Therefore, Applicant submits that claim 7 is patentable over Fung and CA. Further, claims 8-12 depend from claim 7 and include all of its limitations. Thus, Applicant respectfully submits that claims 8-12 are also patentable over Fung and CA.

Further, Applicant submits that claim 13 is patentable over Fung in view of CA. Claim 13 is directed to a computational device configured to define a decision surface separating two opposing classes of a training set of vectors. Among other limitations, claim 13 requires a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. For the reasons stated with respect to claim 1, Applicant respectfully submit that Fung and CA, alone or in combination, fail to disclose, teach, or suggest a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, Applicant submits that claim 13 is patentable over Fung and CA. Further, claims 14-18 depend from claim 13 and include all of its limitations. Thus, Applicant respectfully submits that claims 14-18 are also patentable over Fung and CA.

CONCLUSION

In light of the foregoing reasons, Applicant respectfully requests reconsideration and allowance of claims 1-18. The Commissioner is authorized to charge any additional fees or credit any overpayments associated with this Amendment to Deposit Account 13-0206.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: MAIL STOP AMENDMENT, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450, on January 9, 2008.

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